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Dyslexia: Symptoms and Remediation Results

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THE description and remediation of reading difficulties in children has been complicated by a multiplicity of symptoms associated with a condition defined as "dyslexia", "specific dyslexia", or simply "learning disability". The data presented here were originally given at the Florida Psychological Society's 23rd annual meeting in Miami Beach, Florida on May 1, 1970. They represent the results of testing 32 children (24 boys and eight girls) who entered private clinics (Byron Harless and Associates, Tampa, Florida and Griffiths Inc., Lakeland, Florida) because of reading difficulties, often associated with emotional and behavioral difficulties. These results are compared with data from other studies in a manner to more specifically identify a specific reading problem which may be called "dyslexia". The results or remedial treatment for 28 of the 32 children are also discussed.

Benton (1968) defined dyslexia as "a selective retardation of reading skills, resulting in an observable gap between a child's progress in reading and his progress in other areas of learning. This implies a normal or even above normal I.Q." Kline (1968) stated that dyslexia "refers to patients with severe reading disabilities." Pannbacker (1968) uses the concept "a discrepancy between apparent capacity for learning, verbal or nonverbal, and actual level of achievement" when defining learning disabilities.

Benton (1968) associated dyslexia with eye dominance, control and convergence, but suggested ten symptoms which are often noted for children having this condition. These included, among others, hyperactivity, behavior problems, mixed laterality, and poor identification of body parts.

Kline (1968) would eliminate neurologically damaged or per-

ceptually handicapped children from the dyslexic definition, but does associate mixed laterality, poor coordination, and emotional problems with dyslexia. Pannbacker's (1968) associated characteristics were very similar to those of Benton.

METHODOLOGY

The Wechsler Intelligence Scale for Children, Frostig Developmental Test of Visual Perception, Gilmore Oral Reading Test, and the Harris Test of Laterality were used as diagnostic tools. In addition to the formalized testing, a family history was taken and certain notations were made concerning unlearned laterality. The author is indebted to Dr. Lorain Hite of Byron Harless and Associates for statistical analyses. Twenty one of the 24 boys and seven of the eight girls entered a three month remedial program. Except for four girls and three boys who were seen only 10 or 11 times, all others completed 12 individual remedial sessions.

All sessions were once a week on a one-to-one basis between the author and the individual child, and each hour represented approximately 50 minutes of actual working time. Specific techniques varied from child to child, depending upon individual needs, and upon which procedure appeared to be gaining the most profitable response. The remedial work may be categorized as working with materials which were intrinsically interesting to the children. Although the learning experiences were challenging, they were planned so that the child could feel successful. Competition was eliminated. Although the children had entered the remedial program because of reading difficulties, standard teaching techniques involving phonics, workbooks, and the structured situation of the conventional classroom in which the child had failed, were completely eliminated, and an atmosphere creating trust and value in the child as an human being was established, both through verbal and nonverbal communication. The parents, the teacher, and the child were all apprised of the situation. An attempt was made to explain what had caused the child to behave in the manner which had produced his problems, and hope was held forth that improvement would be made. During the course of the remedial work, about one-half of the children were placed on Ritalin (methylphenidate hydrochloride) by their referring physician, with apparently beneficial effects. The use of ordinary tranquilizers or

sedatives, which had been tried for some hyperactive children, generally resulted in adverse behavior.

At the conclusion of the remedial work the children were again tested with a WISC, The Frostig Test of Visual Perception, and The Gilmore Test for Oral Reading. For the first two tests, the identical form was used in post-testing and it is recognized that there is a possibility of some contamination when the two tests are given within a three months period. In the case of the Gilmore, Form A was given as the pre-remedial test, and Form B was used for the post-remedial testing, so that contamination does not exist insofar as reading improvement could be measured by this test.

The ages of the children at the time they were first seen varied from 6 years and 1 month to 15 years and 9 months with an average age of 9 years and 5 months.

RESULTS OF WISC TESTS

The WISC tests were given to all children. Verbal I.Q.'s varied between 86-137 with an average of 111; Performance I.Q.'s varied between 75-125 with an average of 104; and Full Scale I.Q.'s varied between 79-133 with an average of 108. Three of the children had I.Q.'s (Full Scale) below 90. In Table 1 the average scale scores with standard deviations from this study are compared with those of Wechsler (1949) and Sabatino (1968).

It will be noted that the 200 children presented by Wechsler with a chronological age of 10 years, 6 months had average scale scores that were almost identical from sub-test to sub-test, whereas, there was considerable variation both in this study, and in that reported by Sabatino. Sabatino's children were forty-five boys, aged 6 years and 4 months to 12 years and 2 months, who were failing in either arithmetic or in reading. Sabatino did not define these children as dyslexic, but as individuals with learning disabilities. However, it will be noted that the average scale scores of Sabatino, while lower, were related to each other in much the same manner as were those in the present study. Object Assembly and Coding were exceptions to this pattern.

In the present study, the Coding sub-test had a high standard deviation and was significantly correlated with the Verbal rather than Performance sub-tests, but Sabatino did not find this relationship. The significance of this is impossible to interpret at this time.

TABLE 1
Comparison of WISC scores with Sabatino and Wechsler

	Wechsler 10½		Griffiths		Sabatino	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Information	9.9	2.9	10.4	2.8	9.0	2.0
Comprehension	10.1	3.1	13.9	3.7	10.4	2.3
Arithmetic	10.2	3.1	9.8	3.1	8.1	2.3
Similarities	10.0	3.1	13.3	3.4	11.1	3.3
Vocabulary	10.1	3.1	12.6	3.3	10.5	3.3
Digit Span	10.0	2.9	10.7	3.0	9.1	2.4
Verbal I.Q.	100.0		111.7		97.0*	
Picture Completion	10.0	3.0	11.3	2.8	10.6	2.2
Picture Arrangement	9.9	3.1	10.2	2.4	9.5	2.3
Block Design	10.1	3.0	10.5	2.5	9.9	2.9
Object Assembly	10.1	2.9	9.2	3.8	10.1	3.3
Coding	10.0	3.1	10.1	4.1	8.2	3.0
Performance I.Q.	100.0		103.5		97.0*	
Full Scale I.Q.	100.0		108.4		97.0*	

*Calculated from mean.

When more individual scores can be factor analyzed, some conclusions concerning the status of Coding and its interpretation for children with learning difficulties may become apparent.

Sixty-eight per cent of those tested had a Verbal I.Q. higher than Performance, and when males were compared with females, 67 per cent of the males and 75 per cent of the females had a higher Verbal I.Q. However, when children were separated by age, 54 per cent of those older than 9 years had a higher Verbal I.Q., whereas, of those 9 years and younger, 74 per cent had a higher Verbal than Performance I.Q.

Correlations were run between all of the sub-tests, and these correlations were compared with those of Sabatino, and with the average population at age 10½ presented by Wechsler.

As contrasted with Wechsler where all sub-tests were significantly correlated, the present study and that of Sabatino showed that most Verbal sub-tests were correlated with each other, but rarely with any Performance sub-tests. Performance sub-tests were

significantly correlated in only two instances in each of these studies. The failure to find significant correlations for the two groups of children with learning disabilities when compared with those for Wechsler's normal population, and the variability in sub-test scores for the two studies are suggestive that the WISC alone offers an early opportunity to identify a possible learning disability.

For the children tested here, an analysis of scale scores for individual children suggest patterns which may be helpful in identifying a specific syndrome. Comprehension had the highest average scale score, and it was the highest Verbal sub-test for 50 per cent of all children. Seventy one per cent of the boys and 63 per cent of the girls had Comprehension scale scores at least two points higher than for either Arithmetic or Information. This discrepancy appeared to become exaggerated with age. Both Similarities and Vocabulary had high average scale scores, but no specific pattern was discernible. Both had highly significant negative correlations with age; Similarities showed significant correlation with all Frostig sub-tests except "position in space"; and Vocabulary was significantly correlated with only the Frostig sub-test "spatial relations".

Of the five performance sub-tests, Picture Completion had the highest scale score for 46 per cent of the boys and 37 per cent of the girls, but there were no real patterns which emerged. As noted above Coding appeared to be related to Verbal sub-tests and Verbal I.Q. rather than to other Performance sub-tests.

A considerable variation in sub-test scores, a high Comprehension score as compared with Information and Arithmetic (particularly if the child is more than 7½ years old), and possibly a high Picture Completion score as compared with other Performance sub-tests combine to suggest that the child with such characteristics will be reading below his intelligence capability.

RESULTS OF FROSTIG TESTS

The Frostig Test of Developmental Perception was given to all children. Because of the fact that it measures characteristics only to an age equivalent of approximately 9 years and since 15 of the children in this study were older than 9, problems of interpretation were encountered. However, in the 160 instances where chronological age suggested opportunities to score on a sub-test at the Frostig

TABLE 2
Results from Frostig developmental test

Frostig Test	Age Equivalents in Months					
	All Children			Younger than 122 months		
	All	Female	Male	All	Female	Male
Eye Motor Coordination	90	93	88	79	85	76
Figure Ground	86	84	87	83	76	86
Form Constancy	75	74	76	68	67	69
Position in Space	87	80	90	82	77	84
Spatial Relations	85	88	94	88	82	91
Chronological Age	115	113	116	95	94	96
Number of Children	32	8	24	21	6	15

maximum, only 27 such instances occurred. Table 2 shows the average (arithmetic mean) age-equivalents in months for all children and also separates out the 21 children younger than 122 months. These children all scored well below their chronological age level. They averaged lower on "form constancy" than any other sub-test. The "eye-motor" sub-test results were significantly correlated only with "spatial relations", whereas the other four sub-tests were all significantly correlated with each other.

When males were separated from females, test score results suggested sex differences, particularly for the 21 children younger than 122 months. These low scores, when compared with chronological age, appear to be typical of children with reading problems due to visual perceptual difficulties.

RESULTS OF GILMORE ORAL READING TEST

The Gilmore Oral Reading Test was given to all the children, and results from this are compared with the Frostig and with the WISC I.Q.'s on a comparable basis. This basis was arrived at by dividing the age-equivalent on the Frostig by the chronological age; and on the Gilmore by converting grade to age equivalent by adding 65 months to the grade equivalent and dividing by the chronological age. The approximate average age of children as they enter the first grade in Florida is 65 months. Table 3 indicates that scores on both the Gilmore and the Frostig were low in comparison with the I.Q. of the individual children.

TABLE 3
Comparison of Frostig, Gilmore and WISC results

Test Quotient	All	Female	Male
Frostig: Age Equiv./Age			
Eye Motor Coordination	79	85	77
Figure Ground	78	78	79
Form Constancy	68	71	66
Position in Space	79	77	79
Spatial Relations	84	83	85
Gilmore: Grade Equiv./Age			
Accuracy	87	94	85
Comprehension	93	100	91
WISC: I.Q.			
Verbal	112	111	112
Performance	104	104	104
Full Scale	108	108	108

OBSERVATIONS ON LATERALITY AND ORIENTATION

Left handedness, ambidexterity, mixed-laterality for hand or foot, and particularly problems concerned with focusing eye, dominant eye, and lack of eye convergence have been so often associated with reading difficulties that a review of references is not included here.

In the present study, the Harris Test of Lateral Dominance was administered to all children. In addition to this, Unlearned Laterality tests worked out by the author were also given. There was an extremely high proportion of apparent mixed laterality. On the Harris tests, approximately 70 per cent showed mixed laterality for tasks performed with hands or feet. When testing the focusing eye, 25 per cent were mixed, 25 per cent were left-eyed and 50 per cent were right-eyed.

The tests concerned with knowledge of left and right did show that about 75 per cent of the subjects were confused. Those that were not confused were all 9½ years of age or older. Twenty-two per cent of the children preferred the left hand. This study suggests that mixed laterality or left-handedness may well be associated with a reading difficulty, but what the association means and how it compares to a normal population of normal readers is unknown and requires additional study.

All of the children showed a poor sense of orientation. This was demonstrated by an occasional tendency to go out the wrong door, by having little knowledge of direction, by becoming lost if sent on an errand, or, in some instances, by getting lost in going from one room to another.

OBSERVATIONS ON HYPERACTIVITY

Approximately 85 per cent of the children were definitely hyperactive or had been so. This was characterized by an inability to sit still, movement of hands or feet, the necessity for getting up and moving around the room, and the need to be continually on the move, with usually a relatively short attention span. Some of the older children who did not exhibit hyperactivity at the time of this study were found to have been hyperactive when they were younger and were so categorized. Five children apparently did not have a history of hyperactivity, but these were all 11 years and older, and whether they had simply learned to compensate for hyperactivity or whether they never had it could not be positively determined by questioning of the parents.

Approximately 85 per cent were considered to be behavior problems in school and at home. The behavior problems were primarily associated with their hyperactivity, and with the fact that they were failing to make proper progress, particularly in reading. They were reacting in a hostile manner to punishment and to the admonitions of their teachers and parents that they were not trying hard enough.

Four of the children appeared to be definitely withdrawn, and are here considered to be behavior problems because of the withdrawal tendencies. These were all children of 11 years of age and older. None of the four were exhibiting hyperactivity symptoms at the time of this study. One of these children had a full scale I.Q. of 79, one of 88, and the other two were 123 and 120. The withdrawal symptoms would appear to be associated with their inability to maintain proper learning performance in competition with the peer group.

RESULTS OF REMEDIAL TREATMENT

The results reported here indicate very marked improvement for all children, and it is recognized that such rapid improvement

has not been reported in the literature. Kline (1968) reporting on treatment of dyslexics in a clinic in Wisconsin, suggested that, "A multi-sensory approach, built upon a good basic phonics program is essential to the successful remediation of specific dyslexia. It is necessary to work on a one-to-one basis and the child should be four or five times a week in a one-hour session." Their remedial program extended over a period of approximately one year. Forty-six of the 50 patients who completed therapy showed significant improvement, and they were seen from 21 to 191 times. Of those who did not improve, all had been removed from the program, prematurely.

Reinmuth (1969), in a general discussion of dyslexia, strongly suggests that the child's behavior problems and his negative self-concept can be alleviated in numerous ways, and that since no specific method of treatment is necessarily good for all, various approaches must be made if improvement is to be obtained. The evident need for different approaches in the present study very

TABLE 4

Comparison of WISC Verbal Scores for 21 boys and 7 Girls before and after 3 months of remedial work

Sex		Information	Comprehension	Arithmetic	Similarities	Vocabulary	Digit Span	Verbal I.Q.	Full Scale I.Q.	Age in Months
Male	Pre	9.5	13.7	9.3	12.5	12.1	10.5	108.3	105.3	120.3
	Post	11.0	17.1	10.5	15.1	13.3	11.0	119.3	120.1	123.3
	Gain	+1.5	+3.4	+1.2	+2.6	+1.2	+0.5	+11.0	+14.8	+3.0
Female	Pre	10.9	13.6	9.0	14.0	12.3	11.0	108.4	106.1	103.1
	Post	11.1	16.9	8.7	16.3	14.3	12.0	118.9	120.4	106.1
	Gain	+0.2	+3.3	-0.3	+2.3	+2.0	+1.0	+10.5	+14.3	+3.0
All	Pre	9.9	13.7	9.2	12.9	12.1	10.6	108.4	105.5	116.0
	Post	11.0	17.0	10.1	15.4	13.5	11.2	119.2	120.2	119.0
	Gain	+1.1	+3.3	+0.9	+2.5	+1.4	+0.6	+10.8	+14.7	+3.0

strongly indicates the validity of this hypothesis. While children may be categorized and grouped together, for some traits, information is still insufficient to be certain that an individual child may be

TABLE 5

Comparison of WISC Performance Scale Scores for 21 boys and 7 girls before and after 3 months of remedial work

Sex		Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Performance I.Q.	Full Scale I.Q.	Age in Months
Male	Pre	11.0	9.9	10.9	9.9	9.4	100.8	105.3	120.3
	Post	14.4	11.7	12.5	13.4	10.8	117.6	120.1	123.3
	Gain	+3.4	+1.8	+1.6	+3.5	+1.4	+16.8	+14.8	+3.0
Female	Pre	11.6	10.7	10.0	9.3	10.9	102.1	106.1	103.1
	Post	13.7	11.7	11.9	12.1	11.9	115.9	120.4	106.1
	Gain	+2.1	+1.0	+1.9	+2.8	+1.0	+13.8	+14.3	+3.0
All	Pre	11.2	10.1	10.7	9.7	9.8	101.1	105.5	116.0
	Post	14.2	11.7	12.3	13.1	11.0	117.2	120.2	119.0
	Gain	+3.0	+1.6	+1.6	+3.4	+1.2	+16.1	+14.7	+3.0

diagnosed, and then treated in a specific or rigid manner. Remedial work and treatment must be tailored to fit the individual child and his difficulties.

Tables 4 and 5 separate the boys from the girls, and then combine the two groups to show the average scale scores on the WISC for each of the sub-tests before and after treatment and the differences that resulted. The average ages at the beginning and ending of the treatment period are also shown in months, and, of course, represent a three month period. Statistical analyses run on these data indicated that there was a significant improvement in I.Q.'s for the group, and that there was no sex difference. Four of the seven girls did not complete 12 sessions, and of these two of the four were materially lower than the others in average improvement. The results between the girls and boys appeared to be very comparable. The greatest increase in sub-test scores was found on Comprehension for both girls and boys, and this was the test upon which they had the highest scale score in the pretreatment testing. Only on the Arithmetic subtest did either sex show an average de-

crease. This was true only for the girls, and was true because one child changed from a scale score of 14 to 8. This child was seen 12 times initially, and she had relatively severe reading and behavioral difficulties at the beginning of the treatment. For both sexes, Arithmetic did not improve at a rate comparable to the improvement on the other sub-tests, and, on the average, Digit Span had an even lower increase. In only 15 of 308 Verbal sub-tests recorded were the post-remedial scale scores lower than the pre-remedial ones.

Performance I.Q. increased to a greater extent than did Verbal I.Q. In the case of Full Scale I.Q.'s, there was an improvement of roughly 15 points for the entire group. Only four children, three boys and one girl, had increases in Full Scale I.Q. of less than five, and all showed an increase of at least three points. None of the children showed a decrease on Verbal I.Q., but on Performance I.Q., one boy and one girl showed a slight decrease and one boy remained at identically the same score. This suggests that these children do differ, and that the difference is perhaps even greater in the area of Performance than in Verbal abilities.

Since the children were brought to the clinic primarily because of a reading problem, the Gilmore reading tests are probably the best measure of the remedial results obtained. Table 6 shows the average grade equivalents for the boys and girls and for the entire group before and after a remedial treatment period of three months. Since three months is approximately one-third of a school year, an average increase would normally have been expected to be one-third of a year or 0.33; however, the average gain on Accuracy was

TABLE 6

Comparison of average grade equivalents for 21 boys and 7 girls based Gilmore Oral Reading Tests before and after 3 months of remedial work

Gilmore Test	Male			Female			All		
	Pre	Post	Gain	Pre	Post	Gain	Pre	Post	Gain
Accuracy	3.0	4.5	1.5	2.3	3.8	1.5	2.8	4.3	1.5
Comprehension	3.5	5.3	1.8	2.9	4.5	1.6	3.3	5.1	1.8

1.5 years and on Comprehension the gain was 1.8 years. Statistical analysis indicated the gains were significant. It is important to

TABLE 7

Comparison of Gilmore grade equivalents* divided by chronological age for 21 boys and 7 girls before and after 3 months of remedial work

Gilmore Test		Male	Female	All
Accuracy	Pre	81.0	96.9	84.9
	Post	99.8	105.4	101.2
	Gain	18.8	8.5	16.3
Comprehension	Pre	88.6	103.0	92.2
	Post	104.7	109.0	105.8
	Gain	16.1	6.0	13.6
Full Scale I.Q.	Pre	105.3	106.1	105.5
	Post	120.1	120.4	120.2
	Gain	14.8	14.3	14.7

65 months or the average chronological age for children entering first grade in Florida was added to the grade equivalent to obtain quotients comparable changes in I.Q.

point out here that this reading improvement was not accomplished by working with standardized and recognized reading procedures, but rather by using compensations and specialized techniques to improve ability to understand the words seen. In addition there was apparently an improvement in the child's self-concept. The gain for boys and girls is strikingly similar.

Another way to make a comparison is to convert the grade equivalent to an age equivalent by adding 65 months (average age of Florida children entering first grade) and then calculating a quotient by dividing the reading age equivalent by the chronological age. These calculations are shown in Table 7. It will be noted that at the beginning of the remedial work, these children were reading on a level which was well below that expected for their chronological ages, but their I.Q. averaged approximately 105.

In the post-testing, at the end of approximately three months, the children had risen in Accuracy to 101 per cent and in Comprehension to 105 per cent, or very slightly above their chronological age level, but their average I.Q. during the same period had on the average increased from 105-120. However, the actual amount of gain, 16 points for Accuracy, 14 for Comprehension and 15 for I.Q., are surprisingly similar. Only one child and only in Comprehension

TABLE 8

Comparison of age equivalents in years for 21 boys and 7 girls on the Frostig Test before and after 3 months of remedial work

Frostig Test		Male	Female	All
Eye-Motor Coordination	Pre	7.6	7.5	7.6
	Post	8.9	9.0	8.9
	Gain	1.3	1.5	1.3
Figure Ground	Pre	7.3	6.7	7.1
	Post	8.7	8.8	8.7
	Gain	1.4	2.1	1.6
Form Constancy	Pre	6.6	6.1	6.5
	Post	8.6	9.0	8.7
	Gain	2.0	2.9	2.2
Position in Space	Pre	7.5	6.7	7.3
	Post	8.4	8.7	8.5
	Gain	0.9	2.0	1.2
Spatial Relations	Pre	7.7	7.1	7.5
	Post	8.7	8.7	8.7
	Gain	1.0	1.6	1.2
Age	Pre	10.0	8.6	9.7
	Post	10.3	8.8	9.9
	Gain	0.3	0.2	0.2

scored lower at the post-testing period. It would be premature to try to explain here exactly what took place with these children, but there can be no question that the techniques used resulted in material improvement in I.Q. and in reading Accuracy and Comprehension.

Tables 8 and 9 show comparable data on the Frostig test for that data represented in Tables 6 and 7 on reading ability. Because the Frostig test does not extend past the age of 9 or 10 years, the children who were more than 10 years of age at the pre-remedial test were eliminated from the data in Table 9, but all children were considered in the data in Table 8.

Table 8 compares the age equivalents for all children, separates males from females, and combines both groups to show the average change at the end of the three months of remedial work. There appears to be the possibility that some sex difference exists. The

TABLE 9

Comparison of Frostig age equivalents divided by chronological age for 11 boys and 5 girls based on tests before and after 3 months of remedial work

Frostig Test		Male	Female	All
Eye-Motor	Pre	75.5	87.4	79.2
	Post	96.7	112.2	101.6
Coordination	Gain	21.2	24.8	22.4
Figure Ground	Pre	87.4	80.6	85.3
	Post	103.0	116.0	107.1
	Gain	15.6	35.4	21.8
Form Constancy	Pre	72.4	81.8	75.6
	Post	99.4	120.0	105.8
	Gain	27.0	38.2	30.2
Position in Space	Pre	85.8	88.4	86.6
	Post	96.3	114.0	101.8
	Gain	10.5	25.6	15.2
Spatial Relations	Pre	91.4	92.4	91.4
	Post	103.4	114.0	106.7
	Gain	12.0	21.6	15.0
Full Scale I.Q.	Pre	105.0	110.4	106.7
	Post	123.0	120.2	122.1
	Gain	18.0	9.8	15.4

responses of the two sex groups as shown in Table 8 are not always similar. It will be noted that the post-remedial scores are comparable. Nevertheless, improvement was striking. Among the younger children, scores above chronological age were often attained.

Table 9 considers the same data by dividing the Frostig age equivalent by the chronological age of those children that were less than 10 years of age at the time the testing started. The Full Scale I.Q. is shown at the bottom of the table to show comparative change. The girls show a much greater gain than do the boys, and the gain for the girls is out of proportion to the gain in I.Q. In fact, the gain in the Frostig was greater than for Full Scale I.Q. The gain on individual Frostig sub-test scores for the boys was erratic and was both below and above the gain on Full Scale I.Q. Girls, however, showed greater improvement on all Frostig sub-tests. The

largest gain was registered for both boys and girls on Form Constancy on which they had been the lowest at the beginning of remediation. Because of the small number of children, no significance should be drawn from these data for an individual sub-test, but it is significant that with the techniques used, the visual perceptual gain so far as measured by the Frostig test was considerable, and was in excess of that found with I.Q. as measured by the WISC, or reading ability as measured by the Gilmore.

It is, perhaps, of importance to note that on the WISC scale scores, the sub-test for Object Assembly showed a greater average increase for all children than for any other sub-test. Similarly, for the Frostig test, the greatest gain was on Form Constancy, a sub-test that in many respects is comparable to the WISC Object Assembly. It would appear that something had taken place to materially improve this aspect of a child's visual perceptual ability.

Some of the children in this series were seen for a period of time following the initial three months of remediation, and certain observations concerning them are in order. One boy who was 11 years old at the time testing began had an initial I.Q. of 79, and increased only to 88 with mild improvement in reading ability. Three months were simply not enough in the case of this child, because in the months that followed, the improvement increased at a very rapid rate. It was as though a sudden break-through had occurred in the child's comprehension. In some other instances when remedial work was discontinued the child appeared to suffer some relapse over the course of the next few months. This appears at this time to occur most often in older children. Some children will probably require continuing or periodic remediation work, whereas others may not. Certainly the age of the child before beginning remedial work, the intensity of his visual perceptual difficulties, and the state of his self-concept appear to be major factors in the rapidity of response to treatment and the final successful termination of that response. It is obvious from this study that it varies markedly from child to child. It is anticipated that with sufficient knowledge, some prognosis on the child might well be possible, but in the present status of understanding about this complex of problems, there seems little chance to be sure exactly what should be done and how long it will take. However, the present study clearly indicates that all of the children in this study responded in terms of their visual

perceptive abilities as measured by the Frostig test, in their Accuracy and Comprehension in reading and in their general Intelligence Quotient. This was true regardless of the status of the child at the beginning of remedial work. It was true without exception as these children represent all those who began and continued remedial activities for as long as ten weeks under the author's direction. No failures were encountered, and the result would be strongly indicative that none of these children were suffering from brain damage, but were strictly the victims of visual perceptual difficulties.

SUMMARY AND CONCLUSIONS

Of 32 children who entered a private clinic because of reading difficulties usually associated with behavioral problems, 21 boys and seven girls undertook and completed a three month period of remedial treatment. These children tended to have a high variability among sub-tests on the WISC, a high Comprehension scale score as compared with both information and Arithmetic, and a higher Verbal than Performance I.Q. Age equivalent scores were well below chronological age on most individual Frostig sub-tests. Reading levels as judged by the Gilmore Oral Reading Test were well below suggested I.Q. capabilities. Seventy-five per cent of the children demonstrated mixed laterality and approximately 85 per cent were or had been hyperactive.

Statistical analysis indicated significant improvement in reading ability, visual perception, and I.Q. Improvement in arithmetic was not obtained.

The study is suggestive that children with visual perceptual problems accompanied by reading difficulties can be helped with one-to-one sessions which include individualized techniques related to each child's specific problem areas. Improvement in self concept is important to improvement in reading ability and behavior pattern.

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